

**THE NATIONAL  
SHIPBUILDING  
RESEARCH  
PROGRAM**

ANNUAL REPORT

1992

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## ***FOREWORD***

This is the second published annual report of the National Shipbuilding Research Program. It is intended to publicize the program throughout the American shipbuilding, ship repair, and marine supplier industries. It is our hope that the information contained herein will result in an increased industry interest and participation in the program, especially by the smaller shipyards and those specializing in ship overhaul and repair. The ultimate objective of this publication is to improve the process by which technology is transferred to industrial practitioners, managers, and craftsmen who have the responsibility for making their firms more competitive in the world marketplace. We also solicit their help in focusing our planning to meet the present and future needs of the industry.

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# MESSAGE FROM THE CHAIRMAN



The year 1992 will stand as an historic landmark for the National Shipbuilding Research Program (NSRP). Since our last Annual Report the Congress of the United States passed what might become the most important piece of legislation for the shipbuilding industry since the *Merchant Marine Act of 1936*. Without much fanfare the Congress enacted the *Defense Conversion, Reinvestment, and Transition Assistance Act of 1992 (PL 102-484)*. This legislation authorizes the Department of Defense (DoD) to assist American industry transition from defense markets to commercial markets. Shipbuilding was specifically earmarked to participate in this transition in the Conference Report containing the DoD Appropriations for FY 93. This report stated as follows:

*"The conferees are concerned with the general decline in the health of the American shipbuilding industry. The funds recommended will establish and implement viable opportunities for conversion of the defense-oriented shipbuilding industry to market driven commercial production activities."*

For the U.S. shipbuilding and repair industry this program is both a challenge and an opportunity: a challenge to undertake the enormous effort that will be required to bring our industry back into the world shipbuilding and ship repair markets after an interval of more than half a century, and an opportunity to have ready access to resources needed to bring the full power of American technology and know-how to meet this challenge. Meeting this challenge successfully will require a massive revitalization, perhaps even re-invention, of the industry. If we are successful with this transition we can expect the industry to continue well into the twenty-first century. But more important are the short term effects: tens of thousands of jobs will be saved and our national security will be enhanced by maintaining the skills, technology, and physical plant and equipment needed for an effective shipbuilding industrial base. Failure will likely mean the total demise of our industry as we know it.

To meet this challenge the House Armed Services Committee asked the Executive Control Board of the NSRP to work with the Advanced Research Projects Agency (ARPA) in developing the plan needed to reach our objective of creating a competitive shipbuilding and repair industry by the year 2000. Our instructions were simple and straightforward:

- . The program should be as broad and inclusive as necessary to "make a difference;" it should integrate technological advances with a sound business plan, and it should be persuasive.

- The major focus should be on the implementation of technology and expertise that will advance the industry's ability to compete in world markets.
- Solidarity within the industry is critical. This must be a national program in which all the firms and organizations that make up the American shipbuilding and ship repair industry have the opportunity to participate and benefit as a result of that participation.
- Technology should be considered in its broadest sense, not constrained by any definition of what is and isn't "technology."
- Recognize that there is no single answer. Focus should be on technology as well as programs to lessen the effects of constraining government policies and procedures to develop the expertise, data, and infrastructure to market our products worldwide; and to provide the financial services our customers will need to buy our products.
- Avoid the temptation to advocate the "quick fix," such as government-generated shipbuilding programs, or other subsidy arrangements. Experience has shown this course of action generally results in few gains, if any at all. The improvements should be real and permanent. At the completion of this program the industry should be able to survive and prosper without direct government assistance.
- Minimize bureaucracy, both in the government and within the industry.

In consultation with representatives of the House Armed Services Committee and ARPA, the NSRP Executive Control Board (ECB) has met on several occasions and has prepared their recommendation of the generic program elements that must be addressed if the industry is to become competitive. ARPA has indicated that the program outlined by the ECB will be the core technology program of the National Shipbuilding Initiative (NSI). All recognize that technology alone will not bring about a competitive industry. We understand ARPA is consulting with officials within the government and industry to identify the policies and programs that need to be added to our recommendations for a truly national program. We expect them to include such things as focusing planned shipbuilding programs in ways to maximize productivity improvement, becoming more aggressive with other shipbuilding countries to remove anticompetitive practices, and exploring methods to minimize the cost and risk of investment capital. We might also expect the NSI to include large-scale development and demonstration projects with major industry cost sharing.

An outline of the generic plan developed by the ECB is included in this report. A more comprehensive document will be distributed as the NSI develops within ARPA. At that time we will know if the new Administration intends to follow through with the program, and at what level of funding it will become committed. When we have reasonable assurance that there will be a program to assist our industry transition to the commercial marketplace we intend to solicit the formal support of the shipbuilding and ship repair industry, and invite your participation. To accomplish this we intend to hold a series of national industry forums and workshops during 1993. In order to facilitate the

participation of the smaller shipbuilding and ship repair yards we are in the process of establishing regional advisory and review committees using the offices of the American Waterway Shipbuilding Conference, and the various regional ship repair associations. We also encourage your advice and suggestions.

In the meantime we are maintaining the NSRP as before. We continue to invite your inquiries concerning specific projects from the NSRP Documentation Center at the University of Michigan (313) 763-2465, or from the NSRP Program Management Office at the Carderock Division (David Taylor Model Basin) of the Naval Surface Warfare Center (301) 227-1380.

In the weeks and months to come we will be making you more aware of the activities and plans of the NSRP. Our NSRP newsletter, issued quarterly, will be our primary means of keeping you informed. Project reports will be issued through our normal panel operations.

In the final analysis the success of the NSI as a national program will depend on the willingness of the industry leadership to commit to the program objectives and to make their support Known. You can be assured that the NSRP will continue to do its part.

David P. Donohue, RADM USN (Ret.)  
Chairman, Executive Control Board  
National Shipbuilding Research Program

The Jonathan Corporation  
150 Boush Street  
Norfolk, Virginia 23510  
Telephone (804) 640-7200  
FAX (804) 640-7227

## ***THE PLAN FOR THE FUTURE; The National Shipbuilding Initiatives***

As the United States enters an era free from the tensions of the Cold War, the shipbuilding industry is faced with the problem of a rapidly declining national security requirement for the construction of military vessels. Left to its own devices this downturn will result in the displacement of large numbers of skilled workers and a massive reduction of the shipbuilding segment of the defense technology and industrial base (DTIB). Recognizing that neither of these expected consequences are in the best interest of the United States, the 102nd Congress passed the *Defense Conversion, Reinvestment, and Transition Assistance Act, 1992 (PL 102-484)*. This legislation, designed to assist U.S. industry transition from a defense-based market to the commercial market provides the shipbuilding industry with the greatest opportunity in a generation to regain its position as a leader among maritime nations.

This opportunity could not have come at a better time. After almost twenty years of sluggish activity resulting from the over building of the 60's and early 70's, the shipbuilding market demand appears about to increase. Worldwide, the industry has restructured itself to eliminate most of the excess capacity that had existed previously. In addition, economic and environmental factors have raised expectations for the profitable application of advanced technology in some segments of the marine industry, such as Liquefied Natural Gas (LNG), energy efficient high-speed ships, environmentally safe tankers, and interurban ferry systems. Despite the fact that American shipyards have been 100% committed to the

defense market, they have continued to participate in the development of commercially-oriented industrial technology and management processes. Although there has been limited opportunity to apply these technologies and management processes, the industry has kept itself well-informed on the state of the shipbuilding art worldwide.

From a national perspective, retention of shipbuilding as a viable industry has advantages that not all defense industries can offer. Shipbuilding is labor intensive, it is an entry level industry, and it maintains a significant craft orientation. This combination means that large numbers of American workers enter the work force with little or no skills, receive education and on-the-job training to learn a craft, and then have the opportunity to practice this craft to the master mechanic level whether they remain in the shipbuilding industry or not. Also, the market that the shipbuilding industry is to compete in lies outside the United States; successfully penetrating this market will not take jobs away from American workers.

Organizationally, the U.S. shipyards are in a fortunate position, having demonstrated over a twenty-year period that they are able to work cooperatively with each other and with the government in developing industrial technologies and management processes. During this period the industry has maintained a cooperative (cost shared) program with the government which is very similar to what is intended under the *Defense Conversion, Reinvestment, and Transition Assistance Act*,



1992. This program is called the National Shipbuilding Research Program (NSRP). The original mission of the NSRP was to improve productivity of U.S shipyards in order to reduce subsidies. When subsidies were eliminated the program then addressed reducing the cost of naval ships. The current mission (established in 1990) of the NSRP is to assist the U.S. shipbuilding and ship repair industry in achieving and maintaining global competitiveness. The industry and the NSRP have had along history of successful development and, more important, successful implementation of technology and processes. There is a great deal of corporate knowledge within the industry about what needs to be done, and how to manage a cooperative program such as this.

Since 1990 the mission of the NSRP has been to assist the U.S. shipbuilding and ship repair industry in becoming competitive in world markets. The goal is to capture a 10% share of the world market by the year 2000. The NSRP strategic planning has led to the development of an action plan consisting of thirteen elements which are the generic technology core of the program needed by the industry to become competitive. All involved recognize that technology alone will not bring about a competitive industry. The industry must have the opportunity and the means to apply competitive technology, and the competitive playing field must be fair to the U. S. competitors. A total national program, to be successful, must incorporate all of these elements:

- a technology base on a par with the competition,
- access to the financial resources needed to apply advanced

technology where it is lacking,

- access to the market to justify the capital investment needed, and
- removal of anticompetitive practices in the world marketplace.

Action on the elements identified must be taken within the next two to three years. While it is understood that some elements of the total program may be directed at specific firms or groups of firms, the objectives, strategies, and policies for carrying out the core program will be as follows:

- While the continued development of production technologies will not be neglected, the major emphasis will be on the management and administrative processes used to apply these technologies efficiently to the ship construction process.
- Compressing the cycle time from contract to the delivery of the ship to the customer is of utmost importance.
- Benchmark the most effective application of technology and processes of successful American and worldwide shipbuilding firms with manufacturing, assembly, and construction processes similar to shipbuilding. This will be the major input to the program planning process.
- When suitable technology or expertise representing the highest state of the shipbuilding art is available, attempts should be made to purchase and implement it, then expand and

improve the technology. In our experience this is often the most expeditious and economical way to introduce a new technology into commercial practice.

- Training and other programs designed to minimize the expected impact of work force reduction, both white and blue collar, will receive high priority. Training will include whatever is necessary for conversion of the work force to commercial ship construction standards and practices, and to the rapid assimilation of new technology.
- Every opportunity will be pursued to advance the competitive position of the American marine vendor community.
- The exploration of advanced vehicle, propulsion, navigation, and cargo handling technologies will be included in the program.
- The NSRP has demonstrated the unquestionable value of a combined top-down bottoms-up planning and decision making process, with senior industry management setting the goals and objectives, and the working level practitioner and ultimate user determining what is required to achieve the goals and objectives.
- Finally, the guiding principle for all NSRP projects is that no initiative is pursued unless and until there is a clear plan for the implementation of the results agreed upon by the expected users.

The major emphasis of the initiatives discussed below require short term actions to help American shipyards enter the international market quickly. For the next three years we think the major share of the effort should concentrate on short term objectives rather than on the expectation of major technological breakthroughs at some point in the distant future. After all, if the industry does not make an initial penetration into the world shipbuilding market within the next few years, there will not be a shipbuilding industry to implement advanced technologies in the future. We also recognize that with the funding opportunities presented to us under the *Defense Conversion, Reinvestment, and Transition Assistance Act of 1992*, we can now address initiatives required for the mid-term (three to five years) and the long term (six to ten years) to ensure continued survival of the industry well into the 21st Century.

Following are the specific National Shipbuilding Initiatives which have been defined to date:

#### **1. COMPETITIVE TECHNICAL PERFORMANCE COMPARISON**

A major portion of the U.S. shipbuilding industry has not participated in the world commercial shipbuilding market since before World War II. Since the passage of the *Merchant Marine Act of 1936*, the industry has operated in a protected market competing only against other U. S. firms. It is generally known that in some important way the more advanced foreign shipyards have outstripped the U. S. shipbuilding industry, but our corporate knowledge of the competition is mostly anecdotal. A necessary first step in the industry's attempt to become

competitive is to develop a fact-based assessment of the technical, operational, and business environment of the competition.

The first objective of this initiative is to do a thorough survey of the overseas industry leaders to obtain an assessment of the technology they employ in their product development and production operations. We will also obtain a profile of their business operations, including their blue and white collar manning, marketing practice, and institutional constraints, such as government regulations and labor practices. Parametric indices will be developed based on factors such as product throughput and equivalent dollar volume of business. Concurrent with the survey of foreign yards, an independent survey of U. S. yards will be made using the same methodology. Areas of major difference will be thoroughly analyzed to determine the actions the U. S. firms will be required to take to become competitive, and also to surpass the competition. The most advanced features of the industry will be used as short term target objectives for the National Shipbuilding Initiative. In the long term, continuous benchmarking of all U.S. industries that use technology or processes similar to those employed in shipbuilding will provide advanced development opportunities.

## ***2. INTERNATIONAL MARKETING STUDIES***

The U.S. shipbuilding industry has not participated in the international shipbuilding and ship repair market for over a generation. In order to close this market knowledge gap, it will be necessary for the industry to combine resources

and talents. Since marketing is considered to be business sensitive, it will be necessary for the industry to agree on all aspects of an international marketing initiative and review their position with the appropriate government authorities regarding compliance with existing laws and regulations. For the most part it is expected that this initiative will concentrate on the collection, analysis, and dissemination of international market information. In addition, a full program of market-oriented training and education will be offered through the Maritime Technology Center (Initiative #4). The first step is to hold supervised exploratory meetings with senior U.S. shipyard executives to define issues which must be addressed in establishing and initiating cooperative international marketing studies.

## ***3. SHIPBUILDING STANDARDS***

The development of shipbuilding standards has been an ongoing NSRP program since the mid-1970's. The American Society for Testing and Materials (ASTM) Committee on Shipbuilding Standards (F-25) was established by NSRP Marine Standards Panel (SP-6) in 1976. The lack of commercial ship construction during the 1980's, plus the low level of funding during this period, has deterred the progress gained in the late 70's with the result that there are few American marine standards that will have an application to modern commercial ships.

A major starting point for achieving the paradigm shift required to make our shipyards globally competitive is to obtain a substantially enhanced body of shipbuilding standards which meet international requirements, and those of the

world ship owners. Using the existing standards as a point of departure, an ongoing program can then be initiated to maintain and enhance these standards to take full advantage of valuable American technological advances to the ship buying community.

#### **4. *MARITIME TECHNOLOGY CENTER***

The management, administration, and coordination of a major technology development and demonstration program requires a central focus employing full time personnel to conduct the day-to-day operations. Ensuring the maximum benefit of the completed work requires a central depository for all the technical information and other program deliverables. Technology transfer must be a major concern. In essence, a program such as this demands a management staff with resources to ensure the results of programs are not dissipated through neglect after a project is completed. They would also maintain program assets such as computer programs, audio visual training material, technical documents, a library, and technical search capabilities. The staff of such a center would also manage the business operations of the program, particularly contract administration and industry cost sharing. Beyond the purely management role, a center could provide reusable research assets more economically than renting them if there was sufficient demand from one project to another. Computer facilities, libraries, training facilities, and laboratories are examples of assets which could be economically justified.

The strategy for this initiative will begin with a small staff operating under the charter of a

not-for-profit corporation, with a corporate board consisting of the CEO's of the participating shipyards. If it appears justified as the program matures, the next step would be to form a more permanent facility and organization similar to SEMATECH.

(SEMATECH is a research consortium of all major U.S. semiconductor manufacturers which was formed and funded on a cost-share basis under the auspices of ARPA [then Defense Advanced Research Projects Agency, or DARPA]. The reason for forming SEMATECH was to revitalize the U.S. semiconductor industry, considered vital to national defense, which was quickly losing its market to overseas competition. SEMATECH has played a pivotal role in returning U.S. semiconductor manufacturers to world leadership in quality and market share.)

#### **5. *PRODUCT DEVELOPMENT PROCESS***

For a variety of reasons, including government procurement practice, the shipbuilding industry in the United States has been disconnected from the process of developing and marketing their principal product: ships. Government procurement regulations view the shipyard as a provider of construction services and facilities the ship design is developed independently of the shipbuilding process. This practice is unique and it places the American shipyards at a competitive disadvantage in the world market. Foreign yards market ship designs that are tailored to their facility and production process. This advantage is critical; the most significant gains in ship

uilding productivity during the past thirty years are attributed to the integration of the product, the facility, and the construction process for maximum efficiency.

In order to regain its position in the world market, American shipyards will have to reintegrate the process of product development (marketing, design, and engineering) into their internal operations. Fortunately major portions of this process have been the beneficiary of significant technological advances in the application of computers to design and engineering.

## **6. BUILD STRATEGY**

A build strategy is a master plan for the construction of a family of interim products of similarly configured ships. It provides the shipbuilding organization with advance visibility of the entire production process, and identifies how potential problems with resources (information, material, labor) might affect production. It also suggests a strategy for capturing the production performance information necessary to facilitate continuous process improvement. While each shipyard will have differences in their individual build strategies there is an opportunity to benefit from lessons learned by sharing these strategies.

This program initiative is an overt effort to allow U.S. shipyards to learn from their collective experience in a manner that will benefit all without penalizing anyone. This follows the example of many of our most successful foreign competitors.

## **7. SHIPYARD FACILITY IMPROVEMENT**

For the past twenty years or more U.S. shipyards have lagged behind their foreign competitors in capital facility investment for modern commercial ship construction. The first action required to make the industry competitive is to conduct a comprehensive assessment of the facilities of world class shipyards and compare them with the facilities of U.S. shipyards. This assessment will identify deficiencies in the physical assets of the U.S. shipyards and provide the requirements for an industry capital investment program. While identifying and implementing the most advanced technology available to close the facility gap are important outcomes of this initiative, an even more important result is putting a price tag on the industry investment required, and evaluating alternative approaches to raise the necessary capital.

Recognizing that large-scale manufacturing facilities are highly interactive with a large number of variables, the plan is to employ advanced simulation methodologies to evaluate all the facility alternatives available. Working independently and within the context of the specific ship market they intend to target, each participating shipyard will develop a short range facility improvement plan they will need to become competitive in their target market. An economic analysis of these plans will consider the business aspects of the capital investment required and seek to identify means to raise the required capital. This initiative will support high-tech/high-risk demonstration projects to support a long range facility improvement program.

## 8. *COMPUTER INTEGRATED MANUFACTURING*

All U.S. shipyards are currently using computer technology at various levels. Most have implemented some form of Computer Aided Design (CAD) and Engineering systems. Some shipyards are also using some Computer Aided Manufacturing (CAM), particularly in the areas of steel and pipe fabrication. The most common applications are numerical control cutting of steel plate, and pipe cutting and bending. A few shipyards have expanded their computer applications to implement MRP II systems and material ordering systems.

While the use of computer applications in ship design and construction continues to grow, very little has been done to integrate all the individual computer applications into a total Computer Integrated Manufacturing (CIM) system.

The first objective of this initiative is to quickly determine the state of the art of CAD/CAM, MRP II, and Engineering Management in internationally competitive shipyards, and then acquire and implement the best available systems. This would permit U.S. shipyards to catch up quickly with their foreign competition.

The next step is to establish a U.S. shipbuilding CIM Technology Development Center as part of the Maritime Technology Center (Initiative #4) to continually improve CIM technology in the U.S. shipyards, and to surpass our foreign competition.

## 9. *MANAGEMENT SYSTEMS AND PROCEDURES*

New management systems, procedures, infrastructure, and capabilities are required within the shipbuilding industry in order to make the shift to the global commercial shipbuilding market, and to assimilate the new technology and flow of development resources that the National Shipbuilding Initiative will provide.

The application of these new technologies to shipbuilding marketing, ship design, and the construction processes will require more advanced management methods, and the adoption of a corporate culture that emphasizes continuous improvement employing commercial business practices.

The following areas are typical of those needing attention:

- **Innovation:** Associated with international competitiveness is the need to develop new products which can be brought to the market quickly. Accomplishing this will require major changes in the management organizations of the firms that constitute the U.S. shipbuilding and repair industry.
- **Cost Accounting:** American shipyards use a cost accounting system tailored to the requirements of the government. This is a system which focuses on a set of principles which are irrelevant to the commercial business environment and contribute little to providing the information needed by a firm to be continually improving.

. **Governmental Contractual Requirements:**

An entire generation of shipyard managers have provided management services as dictated by government procurement regulations. These regulations have produced a management infrastructure which is excessively complex and too costly to be practical in a commercial business environment. The entire infrastructure, that is, the entire organization with its management systems, procedure, and reporting requirements, must be redesigned for efficiency and effectiveness in a commercial business environment.

. **Information Improvements in the collection and dissemination of information within the firm and within the industry will have to be improved.**

For the entry level employee, the traditional craft oriented training will be expanded to integrate the worker into the new ship construction process that relies on worker initiative and involvement. For the experienced employee, retraining will be necessary to reapply craft skills to the commercial ship construction environment, and directed away from the standards and practices required for military ship construction. Cross craft training and training for supervisors will be included. To meet the needs of the expected downsizing of the industry, particularly in the early years of the transition, programs will be established to facilitate the workers' transition into other areas of employment. For the salaried employees through the senior levels of management, an intensive re-education program will be required to bring them into the commercial shipbuilding marketplace. For example, the results of almost all of the National Shipbuilding Initiatives, to have any practical results, must be transferred to the individuals in the organization that are in a position to make these initiatives work for the firm.

## ***10. TRAINING AND HUMAN RESOURCE DEVELOPMENT***

Shipbuilding is an entry level, craft oriented, labor intensive industry. Almost every new employee receives some degree of entry level training, and their skills are continually upgraded through on-the-job and classroom training. Those employees that leave the industry do so with substantially more marketable skills than they had when they entered the industry. In making the transition to commercial shipbuilding, training for the hourly and salaried employees will have to be expanded greatly.

Cost effective compliance with labor and employment regulations, and safety and health regulations will have to be a major focus of management. Containing the cost of workers' compensation and health insurance in a non-adversarial environment will require creating a closer alliance between management and the work force. Steps in creating a win-win relationship within the industry will also be necessary if the industry is to be competitive.

## ***11. ADVANCED SHIP SYSTEMS***

The productivity of commercial waterborne commerce has increased significantly as a result of the application of advanced technology. Each increase in productivity or efficiency brought about by the application of advanced technology in the ship provides the ship owner with a market advantage; the competition, with older, less efficient technology, can compensate for this only by accepting a reduction in their profit margin. This trend is expected to continue. As U.S. shipyards begin to participate in the international market they will be expected to provide the best available technology.

The identification of potential technology applications, and the adaptation of this technology to shipboard use, is a process that will contribute significantly to the success of the National Shipbuilding Initiatives. This process has not been supported adequately within the U.S. maritime industry in recent years as a result, our foreign competitors enjoy a position of leadership in this area.

## ***12. ENVIRONMENT***

Shipyards are particularly sensitive to requirements to protect the environment since they are located on waterways and conduct a considerable amount of their work in the open air. Within their limited resources, U. S. shipyards have been vigilant in their efforts to meet the growing public demand to keep water and air free from dangerous contaminants. This initiative will provide them the opportunity to accelerate their efforts to maintain a clean and healthy environment.



## ***PANEL HIGHLIGHTS***

spent an afternoon at Ingalls Shipbuilding shipyard. They ended the year with an October meeting in Cocoa Beach, Florida, which included a tour of the Kennedy Space Center.

(There is no Panel SP-2)

### ***SURFACE PREPARATION AND COATING: SP-3***

#### ***FACILITIES AND ENVIRONMENTAL EFFECTS: SP-1***

Chairman:  
Michael Chee  
National Steel and Shipbuilding Company  
(619) 544-7778

Program Manager:  
Peter Jaquith  
National Steel and Shipbuilding Company  
(619) 544-3500

The SP-1 panel meetings this year included a number of technical presentations on subjects such as the Toxic Substance Control Act, the Clean Air Act, DM 10 Emissions, a hazardous waste tracking system, and a shrink-wrap containment system for superstructure. They began the year with a January meeting in San Diego which included a tour of National Steel and Shipbuilding Company. During the year they worked on eleven projects, seven of which were completed and reports issued. In May they met in Pascagoula where, among other things, they

Chairwoman:  
Kay Freeman  
Ingalls Shipbuilding  
(601) 935-3919

Vice Chairman:  
Scott DeVinney  
Bath Iron Works Corporation  
(207) 443-3311

Program Manager  
Peterson Builders  
(414) 743-5574

The SP-3 panel had three meetings during 1992. These meetings included tours of National Steel and Shipbuilding Company and Ingalls Shipbuilding. They sponsored a number of special technical presentations, such as a description of a shrink-wrap containment system for large structures, fluid handling with pleural component application systems, portable bulk containment, the economics of compressed air systems, and the use of bio-reactors for treating hazardous waste. The panel is currently working on thirteen projects; a project on transfer efficiency requirements was completed.

***DESIGN/PRODUCTION INTEGRATION:  
SP-4***

**Chairman:**

Joe Getz  
Bethlehem Steel, Sparrows Point  
(410) 388-4613

**Program Manager**

Bill Becker  
Newport News Shipbuilding  
(804) 380-7453

The Design/Production Integration panel met three times in 1992. One of these meetings was hosted by St. John Shipbuilding in Canada. An excellent tour of the shipyard was provided, during which panel members had an opportunity to see the application of advanced shipbuilding technology successfully applied to the construction of modern warships. A meeting hosted by National Steel and Shipbuilding Company included a yard tour and a demonstration of their new advanced measuring system.

SP-4 has ten projects underway and expects to begin four additional projects shortly. Those already underway include the development of a generic build strategy, advance measuring, and accuracy in shipbuilding.

***HUMAN RESOURCE INNOVATIONS: SP-5***

**Chairman:**

Charles F. Rupy  
General Dynamics/Electric Boat Division  
(203) 433-2182

**Program Manager**

Peter Jaquith  
National Steel and Shipbuilding Company  
(619) 544-3500

During 1992 the SP-5 Panel had four meetings, during which they dealt with topics such as containment of medical and workers' compensation cost, plans for a national workshop on human resource issues in shipyards, the OSHA Model Safety Program, and developing an economic conversion action plan to minimize the disruption within the industry from the expected reduction in DoD shipbuilding and repair programs. The panel worked on three projects, and issued a report on the results of a survey of programs designed to improve employee morale.

***MARINE INDUSTRY STANDARDS: SP-6***

**Chairman:**

John A. Malone  
National Steel and Shipbuilding Company  
(619) 544-8694

**Vice Chairmen:**

B. J. Griffin  
Avondale Industries, Inc.  
(504) 436-5084

**Gary** North

Maritime Administration  
(202) 366-1859

**Program Manager**

Bill Becker  
Newport News Shipbuilding  
(804) 380-7453

During 1992 SP-6 held three meetings, all of which were held in conjunction with other industry activities: a workshop on planning marine standards, the Ship Production Symposium, and the ASTM Shipbuilding Committee (F-25) meeting. Their meetings included presentations on the Fast Sealift program and the activities of the Technical Advisory Group on Shipbuilding to the International Standards Organization. In addition to members from both public and private shipyards, the membership of SP-6 includes representatives of various government agencies, such as the American Bureau of Shipping, the Coast Guard, and ASTM F-25.

SP-6 completed six projects during 1992, including standard practice for the selection and application of deck covering, and a guide for developing shipyard standards. They distributed a report on the shipbuilding standards planning workshop, a shipbuilding standards master plan, and a compendium of maritime standards. They provided technical and administrative support for standards moving through the ASTM balloting process that resulted in seven shipbuilding standards being approved. A project to introduce metrication into U. S. shipyards began in 1992.

#### ***WELDING: SP-7***

Chairman:

Lee Kvidahl  
Ingalls Shipbuilding  
(601) 935-3564

Program Manager

Peterson Builders  
(414) 743-5574

The Welding Panel met twice in 1992, at which time members had the opportunity to tour the Puget Sound Naval Shipyard, National Steel and Shipbuilding Company, Oregon Graduate Institute, and ESCO. Their meetings included presentations on electroslag cladding, the Weldexcell computer program, a survey of shipyard welding practices in Canada, optimized weldment properties, and the Programmable Automated Welding System. Panel SP-7 is currently working on seventeen projects; four were completed during 1992. These included a report on the evaluation of a portable welding robot, a study of pulse purge for consumable insert welds, and a welding design planning manual. The American Bureau of Shipping completed developing a set of visual reference standards for weld surfaces; 400 sets were distributed throughout the industry.

In addition to having a very active public and private shipyard contingent in the membership, SP-7 has representation from the American Welding Society, the Edison Welding Institute, the American Welding Institute, and the National Center for Excellence in Metalworking Technology.

## ***INDUSTRIAL ENGINEERING: SP-8***

### **Chairman:**

Ron Hockett  
Newport News Shipbuilding  
(804) 380-4765

### **Vice Chairman:**

Larry Tucker  
Mare Island Naval Shipyard  
(707) 646-7621

### **Program Manager:**

Bill Becker  
Newport News Shipbuilding  
(804) 380-7453

The Industrial Engineering Panel met three times in 1992; one of these meetings was held at Ingalls Shipbuilding and included a tour of the yard. A meeting at Puget Sound Naval Shipyard was held in conjunction with the annual Naval Industrial Engineering Symposium that included more than twenty papers on subjects related to ship construction and repair.

The panel has five projects in progress which focus on reducing manufacturing cycle time and identifying non-value added tasks in shipyards. During 1992 the panel completed three projects, which included dealing with shop floor control, improved methods for collecting labor expenditure, and using a personal computer for project management in an integrated planning process.

## ***EDUCATION AND TRAINING: SP-9***

### **Chairwoman:**

Joanna Jones  
Bath Iron Works Corporation  
(207) 442-1100

### **Program Manager:**

Peter Jaquith  
National Steel and Shipbuilding Company  
(619) 544-3500

The Education and Training Panel met three times in 1992. One of these meetings was held in Honolulu, Hawaii, where members had the opportunity to tour the Pearl Harbor Naval Shipyard. An October meeting in Bath, Maine, included a tour of Bath Iron Works Corporation. Panel meetings included a discussion of training assistance to quality function deployment, and the application of zone technology to ship repair and overhaul. During one meeting members were given a demonstration of the application of interactive instructional technology to shipyard training.

The panel is working on five projects with the University of Michigan, all of which are scheduled for completion in 1993.